Section 5
Groundwater Assessment

Section 106(e) of the Clean Water Act (CWA) requires State reporting on the status of their groundwater resources to Congress every two years in the biennial CWA 305(b) report. For the 2000 report and subsequent editions, EPA has required aquifer specific assessments for groundwater resources. To meet EPA expectations, aquifer specific assessments will be done for each of the six populated Hawaiian Islands, namely, Hawaii, Kauai, Lanai, Maui, Molokai, and Oahu. Although the island of Niihau is also populated, it has not been included in the report, since the island of Niihau is privately owned. The island of Kahoolawe is not populated at this time, although there are some individuals working and carrying out activities on the island. The island of Kahoolawe will not be considered in this report.

This groundwater assessment is comprised of four sections. Each of the sections reports on one of the four tables required in the report by the EPA. The tables will be labeled 5-1, 5-2, 5-3, and 5-4. Tables 5-3, and 5-4 will have multiple sheets, one sheet for each of the many aquifer systems. These tables will be numbered 5-3.1, 5-3.2,... and 5-4.1, 5-4.2... etc. Summaries of findings and reporting procedures will be included in each of the four sections.

The Groundwater Protection Program (GWPP) is responsible for carrying out groundwater assessment activities, and under the direction of the Department of Health's Safe Drinking Water Branch (SDWB) will be responsible for reporting on the groundwater assessments in this section of the 1998 CWA 305(b) Report. The following outline will be used for the groundwater assessment.

Groundwater Assessment Outline

Part 1 Major Sources of Ground Water Contamination
- Table 5-1 Major Sources of Ground Water Contamination
- Methodology of Reporting

Part 2 Overview of State Ground Water Protection Programs
- Table 5-2 Summary of State Ground Water Protection Programs
- Summary of State Programs and Activities

Part 3 Groundwater Contamination Summary
- Methodology of Reporting
- *Island of Hawaii*
- Map - Hawaii Aquifer Sectors and Aquifer Systems
- Maps and Charts of Hawaii Aquifer Sectors, Systems, and Contamination Sites
- *Island of Kauai*

Part 1

Major Sources of Groundwater Contamination

Table 5-1 lists the factors considered in selecting a contamination source. The letters in the table correspond to the following list:

A. Human health and/or environmental risk (toxicity)
B. Size of the population at risk
C. Location of the sources relative to drinking water sources
D. Number and/or size of contaminant sources
E. Hydrologic sensitivity
F. State findings, other findings
G. Documented from mandatory reporting
H. Geographic distribution/occurrence
I. Other criteria

The letters corresponding to the contaminants were selected from the following list:

a. Inorganic pesticides
b. Organic pesticides
c. Halogenated solvents
d. Petroleum compounds
e. Nitrate
f. Fluoride
g. Salinity
h. Metals
i. Radio nuclides
j. Bacteria
k. Protozoa
l. Viruses
m. Other

Table 5-1. Major Sources of Ground Water Contamination

Contamination Source	Ten Highest-Priority Sources (T) [1]	Factors Considered in Selecting a Contaminant Source [2]	Contaminants [3]
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications	T	D, G, H	e
Pesticide applications	T	D, G, H	b
On-farm agricultural mixing and loading procedures	T	D, G, H	d
Storage and Treatment Activities			
Land application (regulated or permitted)			
Material stockpiles			
Storage tanks (above ground)			
Storage tanks (underground)	T	D, G, H	d
Surface impoundments			

Waste piles	T	D, G, H	h
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills	T	D, G, H	b, c, d
Septic systems			
Shallow injection wells			
Other			
Hazardous waste generators	T	G, H	e
Hazardous waste sites			
Large industrial facilities			
Material transfer operations			
Mining and mine drainage			
Pipelines and sewer lines	T	G	e, h
Salt storage and road icing			
Salt water intrusion			
Spills	T	G	b, c, d, h
Transportation of materials			
Urban runoff			
Small-scale manufacturing and repair shops	T	B, D, G, H	d, h
Other sources:			

Methodology of Reporting

The findings included in Table 5-1 are mostly representative of data obtained from 1999 State Department of Health Groundwater Contamination Maps, and from the mandatory

groundwater monitoring program.

Tables identical to Table 5-1 were made for each of the islands for which groundwater contaminants had been detected. These islands included the islands of Hawaii, Kauai, Maui, Molokai, and Oahu. These five charts were compared with each other, and the ten highest priority sources were recorded for the final table, Table 5-1.

The true origins of many of the contaminants were not known for the reporting. In some cases the reporting was based upon the best educated estimate. For example, it may have been shown from the reporting that VOC's were present in the water supply. Based upon the knowledge of the surrounding geography and the types of contaminants detected, the contaminant source may have been listed as a possible leaking underground storage tank, or a product spill.

In other cases, the origins of detected contaminants were more evident. This was especially true with respect to areas under pineapple and sugarcane cultivation, and in areas of historic pesticide and herbicide application.

In cases where there is insufficient information to determine the true origins of detected contaminants, ongoing source water assessments will likely improve the accuracy and completeness of any future reporting requirements.

Part 2

Summary of State Groundwater Protection Programs

Table 5-2. Summary of State Ground Water Protection Programs

Programs or Activities	Check (T) [1]	Implementation Status [2]	Responsible State Agency [3]
Active SARA Title III Program	T	fully established	DOH-HEER
Ambient ground water monitoring system	T	under development	DOH-SDWB
Aquifer vulnerability assessment	T	fully established	DOH-SDWB-GWPP/ DLNR-CWRM
Aquifer mapping	T	fully established	DOH-SDWB-GWPP/ DLNR-CWRM
Aquifer characterization	T	fully established	DOH-SDWB-GWPP/ DLNR-CWRM
Comprehensive data management system	T	under development	DOH-EPO

EPA-endorsed Core Comprehensive State Ground Water Protection Program		not applicable	DOH-SDWB-GWPP
Ground water discharge permits			
Ground water Best Management Practices	T	under development	DOH-SDWB-GWPP -CWB-PRCP
Ground water legislation	T	continuing efforts	DOH/DLNR
Ground water classification	T	continuing efforts	DOH-SDWB-GWPP DLNR-CWRM
Ground water quality standards		not applicable	
Interagency coordination for ground water protection initiatives	T	continuing efforts	DOH/DLNR/DOA
Nonpoint source controls	T	fully established	DOH-CWB-PRCP
Pesticide State Management Plan	T	under development	DOA-PB
Pollution Prevention Program	T	pending	DOH-OSWM-CWB-EPO
Resource Conservation and Recovery Act (RCRA)	T	fully established	
Source Water Assessment Program [4]	T	under development	DOH-SDWB
State Superfund	T	fully established	DOH-HEER
State RCRA Program incorporating more stringent requirements than RCRA Primacy	T	fully established	DOH-SHWB
State septic system regulations	T	fully established	DOH-WWB
Underground storage tank installation requirements	T	fully established	DOH-SHWB
Underground Storage Tank Remediation Fund	T	fully established	
Underground Storage Tank Permit Program	T	under development	DOH-SHWB
Underground Injection Control Program	T	fully established	DOH-SDWB-UICP
Vulnerability assessment for drinking water/wellhead protection	T	under development	DOH-SDWB-GWPP
Well abandonment regulations	T	fully established	DLNR-CWRM
Wellhead Protection Program (EPA-approved)	T	continuing efforts	DOH-SDWB-GWPP
Well installation regulations	T	fully established	DLNR-CWRM
Other programs or activities (please specify)			

List of acronyms

DOA	Hawaii Department of Agriculture
DOH	Hawaii Department of Health
DLNR	Hawaii Department of Land and Natural Resources

CWB	Clean Water Branch
CWRM	Commission on Water Resource Management
EPO	Environmental Planning Office
GWPP	Groundwater Protection Program
HEER	Office of Hazard Evaluation and Emergency Response
OSWM	Office of Solid Waste Management
PB	Pesticides Branch
PRCP	Polluted Runoff Control Program
SDWB	Safe Drinking Water Branch
SHWB	Solid and Hazardous Waste Branch
UICP	Underground Injection Control Program
WWB	Waste Water Branch
SARA	Superfund Amendments and Reauthorization Act

Summary of State Programs and Activities

Active SARA Title III Program: This program is administered by the State Department of Health, Hazard Evaluation and Emergency Response program. The Title III program is the Emergency Planning and Community Right to Know Act. The main provisions of the act include, planning for chemical emergencies, emergency notification of chemical accidents and releases, reporting of hazardous chemical inventories, and toxic chemical release reporting.

As part of planning for chemical emergencies the governor of the State appoints a State Emergency Response Commission (SERC), which in turn is divided into Local Emergency Planning Committees (LERC). The LERC's formulate local emergency plans to respond to chemical emergencies in the local areas.

For the first time in the State's history the LERC's have become funded during this last reporting period. This is one success of the program. Also, the program helps to respond to many chemical emergencies. This represents a success for the groundwater pollution prevention program. The rapid response times of acting when being informed of chemical spills, is a valuable asset to the GWPP. Other successes of the program includes, the fact that the program provides guidelines for hazardous chemical occurrences such as spills, and reporting.

Ambient Ground Water Monitoring System: The groundwater monitoring system is not at this time an ongoing State program. Some permitting activities require groundwater monitoring activities. Among these activities include some permitting procedures for golf course construction, and the construction of underground storage tanks. The State Water Commission requires some groundwater monitoring in the construction of wells to determine water levels, and levels of chlorides in the groundwater.

Some success has been achieved in groundwater monitoring with respect to golf courses. Some golf courses have installed groundwater monitoring systems to monitor leachate and chemical infiltration. These golf courses have monitoring data that can be made available to the GWPP. Guidelines for groundwater monitoring for golf courses, and a best management practices guideline are currently being revised. The intent of the guidelines is to assist golf courses in improving water, fertilizer, pesticide, and herbicide management practices to prevent adverse environmental and public health impacts.

Aquifer Vulnerability Assessment, Aquifer Mapping, and Aquifer Characterization: The assessments, mapping, and aquifer classifications for the islands of Hawaii, Kauai, Lanai Maui, Molokai, and Oahu were completed from 1990 to 1993. These reports were the result of a contract between the Department of Health (DOH) and the Water Resources Research Center (WRRC) of the University of Hawaii.

The WRRC identified general aquifer sectors and smaller aquifer systems for the islands. Each aquifer system was divided into aquifer types that were characterized with hydrologic factors such as basal, high level, unconfined, confined, and confined/unconfined conditions, and geologic factors such as flank, dike, perched, sedimentary, or combination aquifer types. WRRC also identified the status of the aquifer types through identification of their development stages, potability/salinity, utility, uniqueness, and vulnerability to contamination. The vulnerability determination applied in this study was based upon geographical limits of the resource, interconnection among groundwater sources, relatively rapid time of groundwater travel, and familiarity with environmental conditions. Vulnerability was ranked as high, moderate, or low. Refer to 5-2.1 for examples of aquifer identification and classification.

The aquifer study described that aquifer types have varying levels of vulnerability to contamination. Aquifers contained or confined by caprock are less prone to contamination than unconfined aquifers which are highly vulnerable to contamination. Table 5-2.1 shows the amount of aquifer units and subunits and represents the unconfined aquifer and vulnerability relationship. The aquifers on Oahu, Molokai, Lanai, and Hawaii have a strong correlation with the unconfined aquifer and vulnerability relationship. On Kauai and Maui the relationship is not as evident as they have lower percentages of aquifers vulnerable to contamination, and they contain a significant number of aquifer systems that contain both perched and flank/dike aquifers that overlay each other.

The WRRC studies have provided a comprehensive profile of the location, composition, characteristics, and vulnerability of Hawaii's aquifers.

Table 5-2.1 Characteristics of Aquifers in Hawaii

Island	Number of Aquifer Sectors	Number of Aquifer Systems	Number of Aquifer Types	Number of unconfined aquifers	Number and % of Aquifer Types Highly Vulnerable to Contamination	
Kauai	3	13	120	98	77	64%
Oahu	6	24	90	66	66	73%
Molokai	4	16	60	60	59	98%
Lanai	4	9	22	22	22	100%
Maui	6	25	113	106	72	64%
Hawaii	9	24	82	82	69	84%

Comprehensive data management system: The State Department of Health Environmental Planning Office has been working toward the development and implementation of a comprehensive data management program. Newer technologies have brought the system closer to being implemented than in the last reporting period, however there still remain some stumbling blocks to the program. These include levels of resource allocations, and problems associated with data compatibility and security.

As time progresses, the Groundwater Protection Program continues to generate its own data, which is compatible with other systems on the network. This data includes data in tabular and spatial form, which is compatible with other similar activities within the Department of Health.

EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP): No continuing efforts on the part of the Groundwater Protection Program are directly related to this program at the current time.

Groundwater Discharge Permits: See Underground Injection Control Program below.

Groundwater Best Management Practices: The GWPP is currently developing Best Management Practices guidelines for golf course construction and maintenance. A groundwater monitoring plan is being developed in conjunction with these BMP's, also for golf courses. This is expected to provide technical information for various aspects of golf course related activities.

The Maui Department of Water Supply has been working on Best Management Practices for various activities which they may need to issue permits for. This is because when certain activities are being proposed within watershed areas, the Department of Water Supply is required to issue permits for the activities. This is expected to assist the public

with technical information when pursuing activities which may be potentially contaminating to groundwater sources.

Ground Water Legislation: This reporting period covers the period of the 19th and 20th Legislatures of the State of Hawaii. The 19th Legislature extended from 1997-1999, and the 20th Legislature is still in session. The 20th Legislature extends from 1999-2001.

During the 19th Legislature, no laws directly related to groundwater were passed. One bill was initially heard, but was dropped in continuing hearings. This bill Senate Bill 2217, was proposed to establish provisions relating to mandatory groundwater testing. The bill would have required all operators of agricultural, golf course, landfill, and park operations to install, maintain, and utilize lysimeters in their operations to detect potential groundwater contaminants. It would have required the director of health to establish by rule, standards for these testings.

Although the bill was not passed, it was brought up again in the 20th Legislature as Senate Bill 6. The bill was initially heard by a committee, but was not taken up again by the latter committees. The bill is now dead, and won't be heard again during this Legislature. This bill was the only bill introduced in the current Legislature directly related to groundwater.

Other bills were introduced into the 20th Legislature that may have been important for groundwater contamination prevention. Among these bills were:

House Bill 684 - this bill would have created a water conservation tax credit for investment in water conservation facilities or devices.
House Bill 705 - this bill would have amended environmental impact statement law to include the preparation of Hawaiian Cultural Impact Statements to certain development activities to include impacts that might affect Hawaiian cultural elements including air, water, lands, ocean, submerged lands or other elements for which permits are required during development activities.
Senate Bill 10 - this bill would establish standards on septic system installations, and in some cases would have included requirements to install groundwater monitoring lysimeters in some wastewater treatment units.
Senate Bill 72 - this bill proposed to create a water conservation tax credit for investment in water conservation facilities or devices.
Senate Bill 990 - this bill proposed to establish a watershed management trust fund to support the maintenance and enhancement of important watershed management areas, amend state water commission powers and duties with regard to the fund and watershed management.
Senate Bill 1223 - this bill would have established an evaluation site assessment rating system for the State. It would have established standards, criteria, permissible uses, and policies for the designation and protection of the agricultural district. It would have added an open district classification to the State land use system. The bill would provide

for a review of lands to identify areas with high value for conservation use in order to assure the protection of natural resources such as ... groundwater quality...
Senate Bill 1248 - this bill would have required the University of Hawaii at Hilo to study the feasibility and desirability of industrial hemp production in Hawaii, and would have established the Hawaii Strategic Industrial Hemp Development Act of 1999. This is related to groundwater issues in that hemp can be grown as a rotational crop in pineapple and other agricultural production activities. It is beneficial as a rotational crop in that it does not require pesticides or herbicides to flourish, it can kill some strains of nematodes, and it has a characteristic of loosening soils. In can be used in integrated pest management plans.
Senate Bill 2514 - this bill would have established a watersheds protection trust fund to fund public and private watershed management projects benefitting water quality, water quantity, and general watershed values within designated watershed areas. It would have established a review board to identify watershed management areas, and would have imposed a watershed protection act.

From the proposed bills above, only Senate Bill 2514 is still "alive". The other bills have not succeeded in being adopted by the latter committees during the legislative process. Although Senate Bill 2514 is primarily centered around watershed protection, it is effective in helping to prevent groundwater contamination in that forested watersheds help to reduce the erosive effects of rain, prevent soil erosion, increase infiltration into the soil, strip moisture from the clouds and help maintain a consistent and dependable source of surface water and groundwater.

Groundwater Classification: See Aquifer Vulnerability Assessment above.

Groundwater Quality Standards: Ground water quality standards for the State have not been developed at this time. However, discharges into groundwater, such as injection well discharges, are closely regulated by the UIC Program, and permit discharge limitations are imposed. It is expected that through Source Water Assessment, and Wellhead Protection Program studies, further development in groundwater quality standards may eventually be required.

Interagency Coordination for Groundwater Protection Initiatives: Interagency coordination for groundwater protection continues to be an ongoing activity in all aspects and programs related to groundwater protection.

Recent efforts have been focused on SWAP activities. During the early stages of SWAP, technical advisory committees were formed to discuss overlying and underlying issues related to the program. The advisory committees were made up of citizens involved in water management, and other water related occupations. The advisory committees were instrumental in developing the State SWAP program.

Currently the GWPP is working with the Groundwater Foundation in the presentation of SWAP workshops to the public, to those working in water related disciplines, and to other agencies which will play a role in SWAP related activities.

Nonpoint Source Controls: The Polluted Runoff Control Program (Nonpoint Source Program) is involved in the implementation of grants to parties which have as their goal the reduction and prevention of polluted runoff.

The program is administered by the DOH Clean Water Branch. During recent years the program has sponsored approximately 35 projects. The program reports that some of its failures are that there are a lack of State resources.

The Nonpoint Source Program is closely linked with the GWPP through SWAP, in that some of the Nonpoint Source watershed protection areas are used as delineations for the delineation phases of surface waters in SWAP.

Pesticide State Management Plan: The Pesticide State Management Plan is currently under further development by the State Department of Agriculture, and the EPA. It was thought that the plan would have progressed more to this date, however problems were encountered with respect to design methodologies. The plan originally proposed was thought to be too expensive, and have the negative impacts of slowing agricultural interests.

Pollution Prevention Program: The Pollution Prevention Program (P2) is administered by the Office of Solid Waste Management of the DOH. The P2 program has as its goal the prevention of waste generation. It seeks to change processes of businesses which generate waste streams, to minimize or eliminate waste generation.

The program reports that some of its failures include the lack of better communication between enforcement and compliance assistance. The program is not regularly involved in groundwater protection activities, however, through the minimization of waste groundwater is less vulnerable to contaminants coming from waste generation and storage practices.

Resource Conservation and Recovery Act (RCRA) Primacy: The main focus of the RCRA is to regulate waste generators. The Act participates in the regulation of hazardous wastes, solid wastes, and underground storage tanks (UST).

Some regulations related to solid waste generators include the establishment of engineering requirements in landfill construction. These regulations ensure that landfill leachates are not free to leach into the soil, and groundwater resources. Some regulations related to UST's assure that UST's are constructed properly, that there is no corrosion on the UST, and the methods for determining whether a tank is leaking. These measures also ensure that groundwater contaminants do not leach into the surrounding soils and

groundwater below.

Source Water Assessment Program: The Hawaii Source Water Assessment Program is currently in progress. The actual SWAP plan has been submitted for EPA approval, and was approved during this reporting period. Current efforts include completing four demonstration projects, determining capture zones for wells, performing vulnerability assessments for wells, performing intrinsic susceptibility analyses for wells, ranking the wells in terms of potentially contaminating activities, and determining management measures to prevent groundwater contamination. After the demonstration projects are evaluated statewide, some water assessment will begin, and the entire state will be covered.

The SWAP program is the most comprehensive groundwater pollution prevention activity currently being managed by the GWPP.

Approximately 15% of the State's public water supply systems have some source water assessment activity in place. Although none of the State's community water supply systems have all phases of source water assessment in place, the 1997-1999 Wellhead Protection Biennial Report, submitted to EPA in January of this year, provides information of the phases of the Source Water Assessment Program that have been completed. It is likely that all or nearly all of the community water supply systems of the Islands of Hawaii, Kauai, Lanai, Maui, Molokai, and Oahu will have a full source water assessment programs in place by the following reporting period.

State Superfund: The State Superfund is an EPA managed fund set aside for the investigation and cleanup of contaminated sites. Contaminated sites include sites contaminated by military ordnance, chemicals, battery acids, fuels, and other hazardous materials. The program is valuable in that it helps to prevent groundwater from contamination from some of the most heavily contaminated sites.

State RCRA Program incorporating more stringent requirements than RCRA Primacy: The State RCRA program is much the same as the federal RCRA program. There are no known State requirements more stringent than the federal requirements to the GWPP.

State Septic System Regulations: The State Septic System Regulations program is administered by the DOH Wastewater Branch. The program reviews and approves plans for the construction of septic systems. The program oversees final inspections by engineers, and responds to complaints and conducts enforcement actions.

The program has been successful in that not many complaints are received related to cesspool contamination. Also, in conducting water system monitoring by the Safe Drinking Water Branch, no bacteria has been discovered as having originated from cesspools.

Underground Storage Tank Remediation Fund: The Underground Storage Tank Remediation Fund relates to a trust fund set up to finance cleanup of contaminated sites as a result of underground storage tank leakages. Leaking storage tanks may be detected as a result of tank removal, or from leak detection practices installed on the systems. Usually underground storage tanks are tested on a monthly basis.

This program is a valuable asset to the GWPP in that it monitors monthly to determine if leakage is occurring. This is important because leakage, if occurring, may have spread some distance underground, and the signs of leakage may not be visible at the ground's surface.

Underground Storage Tank Permit Program: The Underground Storage Tank Permit Program is administered by the DOH Office of Solid Waste Management. As of January 2000, for all new tanks going into the ground, information relative to the tank is required. The information will provide details such as the type of the tank, where it will be located, the owner of the tank, and diagrams of the tank system.

This program is beneficial to the GWPP in that it will provide more information about the tanks, and possibly the types of contaminants the tanks may hold. This may be useful in determining sources of contaminants appearing as a result of groundwater monitoring.

Underground Injection Control Program: This program is administered by the DOH Safe Drinking Water Branch, Groundwater Pollution Control Section. The UIC Program is integrally linked with the GWPP. The purpose of the program is to regulate underground injection well activity in the state. Regulating activities include permitting, construction review, field inspections and monitoring data evaluation, and enforcement.

Successes of the UIC program for the reporting period include the numbers of well closures. For the period from 1998-2000, the UIC program reports 17 closures in 1998 and 27 in 1999. Well closures primarily include sewage injection wells and surface drainage wells. Also, the UIC program reports the tentative closure of one well approximately 1017 feet deep, once injecting into a major potable aquifer on Oahu.

The closure of these and similar injection wells is gratifying for the GWPP, because the presence of these injection wells can contribute to groundwater contamination.

Vulnerability Assessment for Drinking Water/Wellhead Protection: Vulnerability studies were conducted and reported on during the last reporting period. Vulnerability studies were made for the islands of Maui, Molokai, and Oahu as part of the Hawaii Wellhead Protection Program.

Wellhead vulnerability studies are currently being carried out in conjunction with Hawaii SWAP activities. Most Wellhead Protection activities have been set aside for the present time in order to complete SWAP assessments, because the two programs are very similar

in nature and scope.

Well abandonment Regulations: Well abandonment regulations are set forth by the State Department of Land and Natural Resources, Commission on Water Resources Management. The purposes of the regulations provide minimum standards in the technical aspects of the abandonment of wells. The regulations ensure safe and sanitary closures of wells, and give priority to environmental safety, groundwater contamination and public safety in the abandonment of wells. The UIC Program also has stringent well sealing and abandonment guidelines used specifically for injection well closures.

Wellhead Protection Program (EPA-approved): The Hawaii Wellhead Protection Program has not been fully completed. It has been a worthwhile program, however, and has provided the Hawaii SWAP with tabular and graphic data, as well as expertise in similar efforts. Although the Hawaii Wellhead Protection Program has not been completed, it has not received as much effort to be completed during the reporting period, as has the Hawaii SWAP.

Many elements of these two programs are interchangeable with each other, and the Hawaii SWAP is more comprehensive. For this reason Hawaii SWAP has been the major groundwater protection activity for the time of the reporting period.

Well Installation Regulations: Well installation regulations are set forth by the State Department of Land and Natural Resources, Commission on Water Resources Management. These standards are considered to be minimum standards for the construction of wells and pumps and pumping equipment to ensure safe and sanitary maintenance and operation of wells.

These standards contribute to groundwater pollution prevention in that they ensure that wells and well equipment are installed so that waste minimization and groundwater pollution prevention are of the bases of the regulations.

Other Programs or Activities: The following list represents other agencies that are directly and indirectly involved in groundwater protection efforts. These agencies regulate the uses of land and promote safe and healthy environmental practices.

State land use and zoning: This program is regulated under the State Land Use Commission, Department of Business, Economic Development, and Tourism (DBEDT). LUC regulates the statewide zoning system with established land uses in Urban, Agricultural, Rural, and Conservation districts. LUC decides upon any amendments to redistrict state land use districts. LUC regulates land use activities in agricultural and conservation districts, and counties regulate urban and rural areas under 15 acres.

State land use boundary review: This program is regulated by amendment reviews by the Office of Planning (DBEDT). The Planning Office represents the State in LUC

amendment petitions. The office conducts research and public hearings on land use boundary reviews and changes.

Resource Conservation Service: The Resource Conservation Service Program regulated through conservation plans by the Natural Resource Conservation Service (NRCS), United States Department of Agriculture. The NRCS provides technical assistance to agricultural activities in areas of production and cultivation practices, and economic management of activities. Conservation plans provide proper production methods and the use of best management practices to minimize adverse environmental impacts.

County planning and land utilization: The County Planning and Land Utilization Authority is regulated through zoning approvals and penalties by County Planning and Land Utilization Departments. The county planning and land utilization entities regulate specific land uses in each county. They implement respective zoning and land use laws affecting all urban and rural areas as well as some agricultural state land use districts. The LUC decides upon land use changes of 15 acres or more.

Part 3

Groundwater Contamination Summary

Methodology of Reporting

The groundwater contamination summary has been based on the information required in Table 5-3. A separate table has been made for each of the aquifer systems of the islands being reported. The total number of aquifer systems is 111. Each aquifer system is part of an aquifer sector. For example, there are 9 aquifer sectors on the Island of Hawaii, and 24 aquifer systems. Although there are specific aquifers in each of the State's 111 aquifer systems, this report includes details only to the system level.

Table 5-3 requests information for the following contamination sites:

1. National Priority List (NPL) sites
2. CERCLIS sites
3. DOD/DOE sites
4. LUST sites
5. RCRA Corrective Action sites
6. Underground Injection sites
7. State Priority sites or State Sites
8. Non-Point Source sites, and
9. Other sites

NPL Sites: Hawaii has only 4 NPL sites. These sites are listed as Pearl Harbor, Schofield Barracks, Del Monte Kunia, and the Naval Computer and Telecommunication Area

Master Station (NCTAMS). These sites were outlined in GIS, and a coverage was then made to delineate the sites. When compared to existing GIS coverages which outline aquifer sectors and aquifer systems, it was possible to determine which aquifers might be affected by these sites.

CERCLIS Sites: State CERCLIS sites were obtained using data which the DOH HEER office receives on a monthly basis from the U.S. EPA. The addresses of these sites were located and placed, and a GIS coverage was then made of CERCLIS sites. The EPA reports that the State currently has 72 CERCLIS sites. Some of these sites are still in the discovery stage, however, and were not included in the GIS coverage. There were a total of 43 sites placed in the GIS coverage. These sites were all sites rated as having a high or low priority status, and thus were thought to be all sites having remediation plans.

DOD/DOE Sites: A list of State DOD and DOE sites was obtained from the DOH HEER office. These sites were outlined in GIS and a coverage was made. There was a total of 19 sites placed, however 7 of these sites were all a part of Pearl Harbor. Other sites listed were Barbers Point Naval Air Station, Bellows AFB, Hickam AFB, Kipapa Fuel Storage Area, NCTAMS, and Waikakalaua Fuel Storage Area.

LUST Sites: The State DOH Solid and Hazardous Waste Branch maintains databases of underground storage tanks, and leaking underground storage tanks. There was an existing GIS coverage of USTs. Data tables were matched for the USTs and LUSTs. There were approximately 420 matches. This data was used as a coverage of LUSTs. This coverage made up approximately 50% of the total number of LUSTs. Many of these LUSTs were military and government owned and operated LUSTs. For LUSTs that were not military owned and operated a coverage was made of the approximate areas of the tanks. This coverage included a total of 102 LUSTs. A separate GIS coverage was made for the remaining military and government owned LUSTs. One point was placed for each government facility. Most facilities had several LUSTs. The exact locations within the facilities were not known however. The following represents the listed government facility and the numbers of LUSTs located at the facility. There were a total of 24 sites placed. These 24 sites accounted for a total of 289 LUSTs.

RCRA Corrective Action Sites: The State DOH Office of Solid and Hazardous Waste maintains a list of RCRA Corrective Action Sites. A total of 3 sites were reported at this time. These sites were located approximately, and a GIS coverage was made for RCRA Corrective Action sites.

UIC Sites: The State DOH Safe Drinking Water Branch Underground Injection Control Section maintains files and a database of UIC wells, and well information. Information from the database was used to make a GIS coverage of UIC wells. The coverage lists 136 UIC wells. The list is complete for those facilities which have active permits. Facilities which have dry wells, or which have standing permits were not included in the report however. There are currently 176 dry wells which have active permits.

State Sites: The State currently has 5 sites listed as State Priority Cleanup Sites. The State Sites are:

1. Del Monte Kunia
2. Honolulu Harbor
3. Pearl Harbor
4. Schofield Barracks, and
5. Waikakalaua/Kipapa Fuel Pipeline.

These sites were also placed in a GIS coverage, and were compared to aquifer system boundaries.

Non-Point Source Sites: The locations of non-point source sites were obtained from the State DOH Polluted Runoff Control Program. The non-point source sites used for the groundwater section of the report are made up of water quality limited segments (WQLS). Although several watersheds make up one WQLS, only the WQLS was used for the groundwater section of the report. The WQLS shows the locations of high priority surface waters. It is not known exactly how much the surface waters interact with groundwater aquifer systems.

Other Sites: Table 5-3 lists one row as the "other" sites which may be contributing to groundwater contamination. For this category, only information from the groundwater monitoring program was used. Contaminant inventories were matched with wells, and the contaminants were noted. Only the contaminants not thought to be naturally occurring were noted. Although this category does list some of the contaminants detected in the wells, it is incomplete. A more thorough analysis of contaminants found in wells is given in Section 4 - Aquifer Monitoring Data.

The following maps and tables 5-3.1 through 5-3.111 represent the information described above.